BLACKLIGHT TRAP COLLECTING OF PARASITIC HYMENOPTERA[1].[2]

Paul P. Burbutis[3], James A. Stewart[4]

ABSTRACT: Many species and large numbers of parasitic Hymenoptera were captured in a 15-watt, standard insect survey blacklight trap. It appears that routine trapping of these parasitoids by this method can be used to determine species composition, and their relative abundance and seasonal distribution. This common survey technique, in widespread use for pest species, may hold considerable promise for biological control specialists and in integrated pest management programs.

Radiant energy in the form of blacklight (ultraviolet = 320 - 280 nanometers) is used extensively for insect detection, routine survey and pest management programs. The usefulness of blacklight traps in integrated pest management (IPM), especially for determining the seasonal distribution and abundance of economic species, is widely recognized. Much of the information on insect light trapping is consolidated and treated in depth by Hienton (1974) however no attention is given to the beneficial insects which are strongly attracted to these same sources.

Tests by Weiss et al. (1941, 1942, 1943) show that parasitic Hymenoptera are very specific in their response to blacklight. Frost (1964, 1966, 1969) trapped insects during the winters of 1958 - 1963 in Florida and he lists ca. 80 species of parasitic Hymenoptera collected in this manner. A few other reports either cite unusual collections or the occasional capture of a large-size species of Ichneumonidae. From ca. 900 papers dealing with light trapping of insects less than 30 mention parasitic Hymenoptera as being captured in light traps. In most cases the lack of reference to parasitoids does not mean these forms are absent in trap collections but most likely that they are disregarded or overlooked because of their small size.

The results of preliminary studies in 1968 and 1969, at the USDA Beneficial Insects Laboratory in Moorestown, N.J., suggested that blacklight trapping may provide a mechanism for determining seasonal distribution and relative abundance of parasitoids. Such data could be very useful in biological

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[3] Professor, Univ. of Del., Newark.

[4] Formerly Biologist, USDA, ARS, Moorestown, N.J.

control especially in evaluating host-parasitoid spacial and temporal relationships and in parasitoid release programs where synchronization with the host is critical. This paper reports on those species of parasitic Hymenoptera captured in 1970 in a standard survey blacklight trap, and presents information on the possible use and importance of this attraction.

Methods and Equipment - A standard 15-watt insect survey trap (Harding et al. 1966) was operated nightly at Moorestown, NJ from April 10 to November 24, 1970. The trap was operated from 1/2 hour after sunset to 8:00 A.M. Specimens captured were either determined daily or frozen until such time as determinations were possible. Preserved specimens are in the reference collection of the Department of Entomology and Applied Ecology, University of Delaware or in the USDA Systematic Entomology Laboratory at the U.S. Museum of Natural History.

Results - A total of 2,931 parasitic hymenoptera were captured and classified into 81 taxa representing 19 families. Many specimens were determined only to higher taxa because the systematic knowledge of the group is incomplete. Several species are recognized as new and further study of those forms determined only to higher taxa will very likely lead to the recognition of other new species.

The following are the parasitic Hymenoptera and the numbers captured:

Braconidae: *Meteorus levinentris* (Wesmael) 166, *M. communis* (Cresson) 51, *M. hyphantriae* Riley 31, *(M. versicolor* (Wesmael) 10, *M. dimidiatus* (Cresson) 9, *M. loxostegei* Viereck 1, *M. tauricornis* (Provancher) 3, *M. trachynotus* Viereck 2, *Streblocera* n. sp. 42, *Microctonus* n. sp. 3, *Leiophron* sp. 1, *Macrocentrus grandii* Goidanich 218, *M. crambivorus* Viereck 970, *M. delicatus* Cresson 17, *M. cerasivorianae* Viereck 2, *M. amicroploides* Viereck 2, *M. ancylivorus* Rohwer 1, *M. aegeriae* Rohwer 1, *Taphaeus* sp. 1, *Zele* n. sp. 9, *Neoblacus* n. sp. 2, *Blacus bissigmatus* (Say) 467, *B.* 5 spp. 26, *Hysterobolus* n. sp. 6, *Centistes* n. sp. 16, *Eubadizon extensor* (L) 9, *E.* 2 spp. 15, *Triaspis* sp. 3, *Aliolus* spp. 7, *Adelius fasciipennis* (Rohwer) 1, *A.* n. sp. 1, *Apanteles* spp. 65, *Microgaster* spp. 5, *microplitis* sp. 1, *Phanerotoma* spp. 27, *Ascogaster* sp. 1, *Aphaereta* sp. 6, *Pseumosema* sp. 2, *Mesocrina* sp. 1, *Asobara* sp. 1, *Opius* spp. 3, *Bracon* spp. 9, *Rogas terminalis* (Cresson) 11, *R.* 4 spp. 35, *Clinocentrus* sp. 1, *Colastes* sp. 1, *Pelecystoma* sp. 1, *Hormius* sp. 5, *Doryctes* sp. 1, *Heterospilus* 1.

Aphidiidae: *Aphidius* spp. 5.

Ichneumonidae: *Ophion bilineatus* Say (Complex) 189, *Encospilus purgatus* (Say) 42, *Netelia* 3 spp. 33, *Temelucha* spp. 43, *Pristomerus* spp. 3, *Coccygominus* sp. 3, *Gelini* 4 spp. 88, *Mesochorus* spp. 40, unidentified Ichneumonidae 105.

Mymaridae 1, Eulophidae 4, Encyrtidae 2, Torymidae 3, Pteromalidae 10, Eurytomidae 1, Figitidae 2, Cynipidae 10, Proctotrupidae 14, Ceraphronidae 2, Diapriidae 9, Scelionidae 3, Platygasteridae 1, Bethylidae 5, Dryinidae 19, Tiphidae 1.

The data indicate that blacklight traps are useful for determining the relative abundance and seasonal distribution of parasitoids. Many of the species collected showed clear population (= flight) peaks and number of

generations (Figures 1, 2 and 3). Figures 4, 5 and 6 illustrate the seasonal relationships between several parasitoids and their hosts.

Macrocentrus crambivorous Viereck (Fig. 4), the most abundant parasitoid captured, does not appear to correlate well with its hosts *Crambus* spp. except late in the season. Figure 5 depicts the relationship between *Macrocentrus grandii* Goidanich and one of its main hosts the European corn borer, *Ostrinia nubilalis* (Hubner). These flight data indicate a relationship between the two species, viz. adult parasitoids are most numerous following the peak adult flights of its host. In Figure 6 the armyworm, *Pseudaletia unipuncta* (Haworth), is represented by 3 peak flights and *Meteorus communis* (Cresson) corresponds very well to the first and third host peak but is almost absent in relation to the second one. *Rogas terminalis* (Cresson), another parasite of *P. unipuncta*, appears with each flight peak but at low levels.

Discussion and Conclusions - The results of this study show that many parasitic Hymenoptera can be collected in the standard blacklight insect survey trap and that such trapping can also be useful for determining their relative abundance and seasonal distributions. Blacklight trapping holds considerable promise for the specialist in biological control. For those parasitoids attracted to blacklight, a commonly used, quantitative method is available for determining the synchronization of parasitic species with their hosts. Also, a technique that measures adult parasitoids could be valuable for evaluating their impact as mortality agents.

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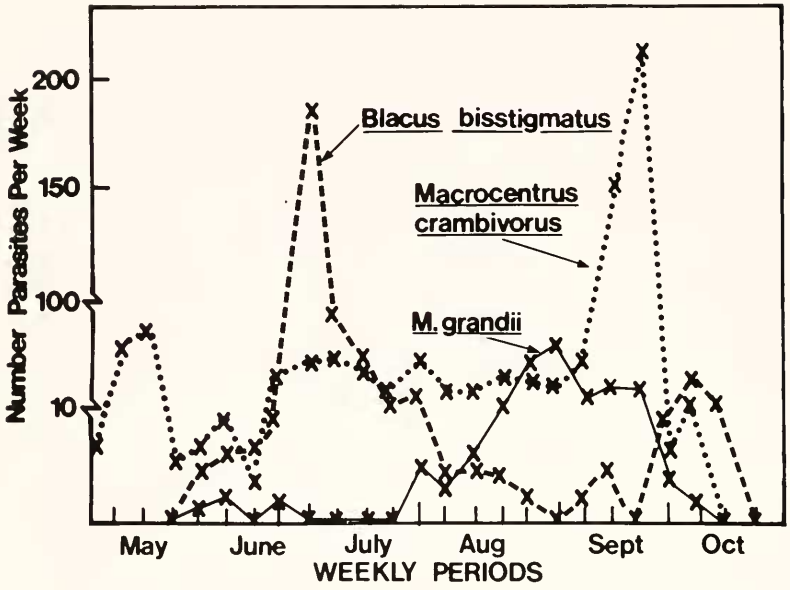

Fig. 1. Seasonal distribution and abundance of *Blacus bisstigmatus, Macrocentrus crambivorus* and *M. grandii*.

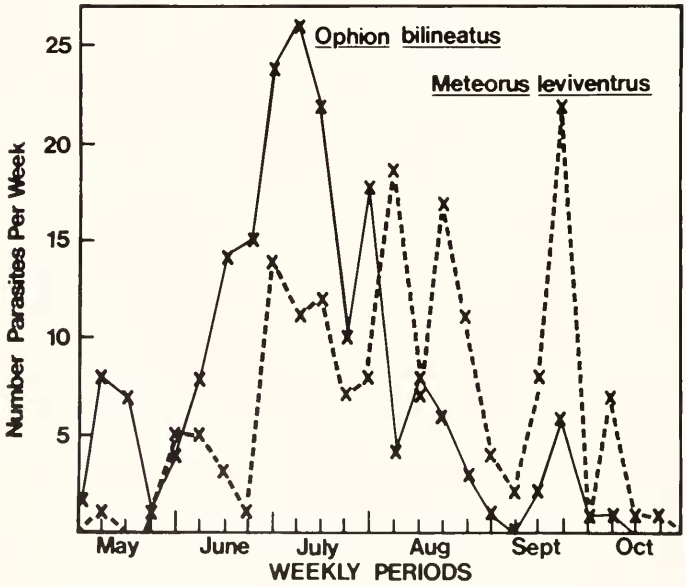

Fig. 2. Seasonal distribution and abundance of *Ophion billineatus* and *Meteorus leviventrus*.

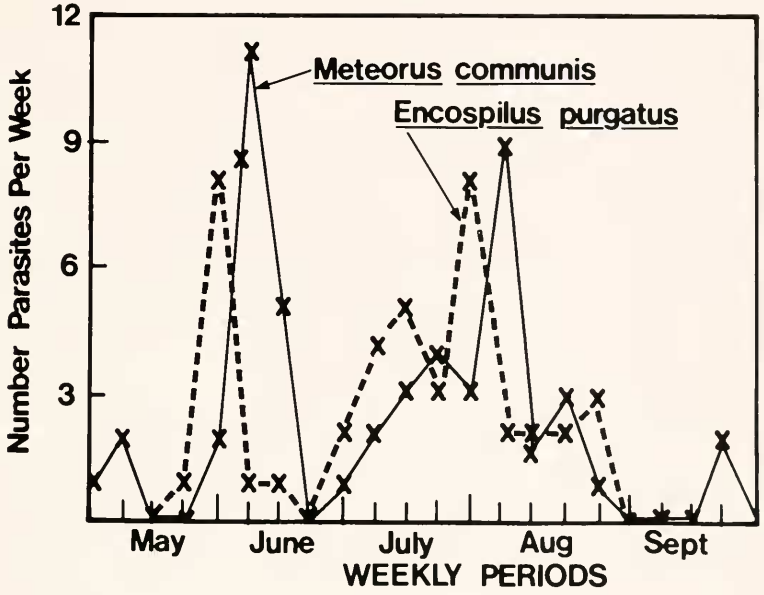

Fig. 3. Seasonal distribution and abundance of *Meteorus communis* and *Encospilus purgatus*.

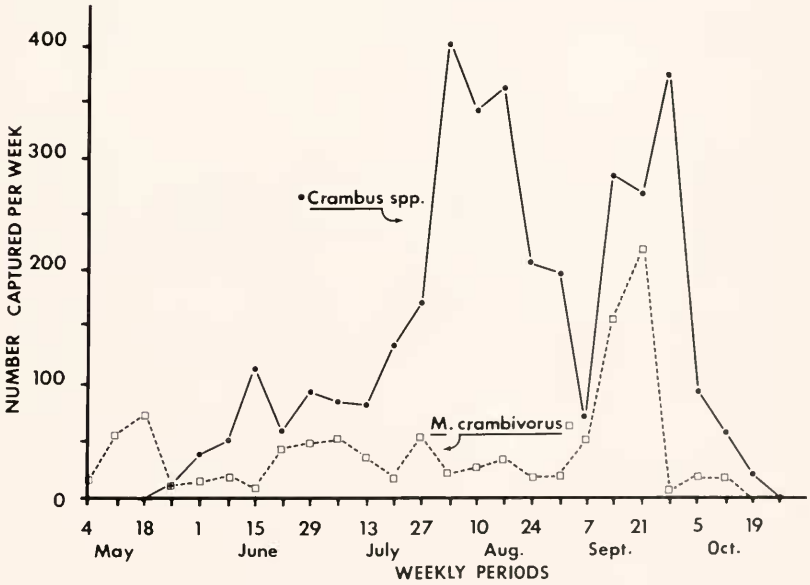

Fig. 4. Seasonal distribution and abundance of *Crambus* spp. and the parasitoid *Macrocentrus crambivorus*.

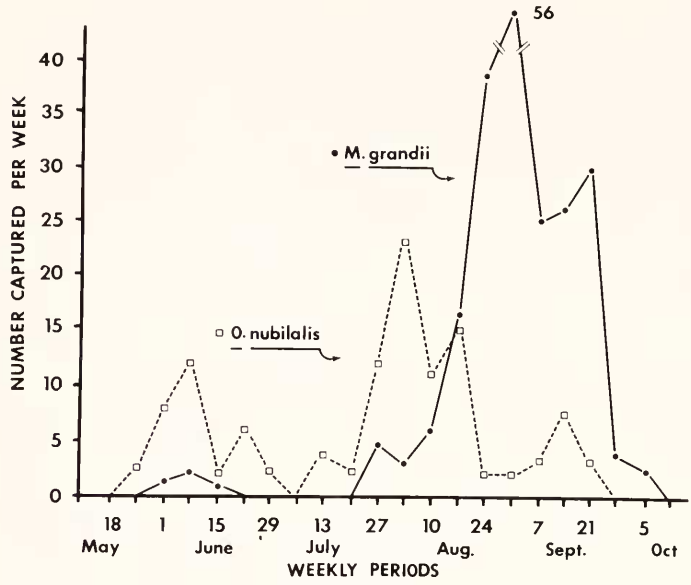

Fig. 5. Seasonal distribution and abundance of *Ostrinia nubilalis* and its parasitoid *Macrocentrus grandii*.

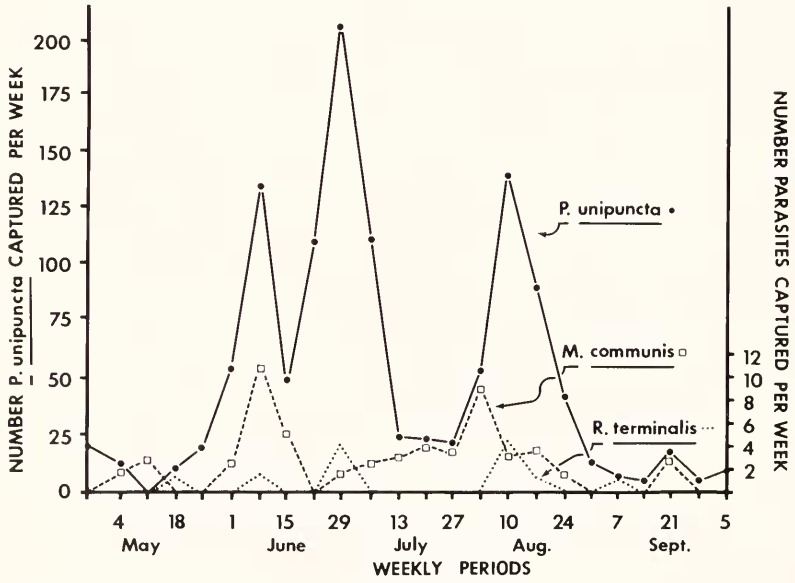

Fig. 6. Seasonal distribution and abundance of *Pseudaletia unipuncta* and its parasitoids *Meteorus communis* and *Rogas terminalis*.